JC05 Rec'd PCT/PTO 28 FEB 2002

FORM PTO-1390 (REV 10-94) U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371	616.98USWO
	U S APPLICATION NO (If known, see 37 C F R 1 5) UNKNOWN 10/070009

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP00/10129	OCTOBER-14-2000	OCTOBER-28-1999

TITLE OF INVENTION

PRODUCTION OF CATALYST LAYERS ON MEMBRANES FOR LOW-TEMPERATURE FUEL CELLS

APPLICANT(S) FOR DO/EO/US

GUPTA, Ashok Kumar; TIETZ, Dr. Frank; BUCHKREMER, Dr. Hans Peter; KUNDLER, Dr. Isabel

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. [X] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [X] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. [X] has been transmitted by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US)
6. [X] A translation of the International Application into English (35 U.S.C. 371(c)(2)).

7. [X] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [X] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] have been transmitted by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.

8. [ ] A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).

9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).

10. [ ] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98., Form 1449, 5 references

12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.

13. [X] A FIRST preliminary amendment.
    [ ] A SECOND of SUBSEQUENT preliminary amendment.

14. [ ] A substitute specification.

15. [ ] A change of power of attorney and/or address letter.

16. [X] Other items or information: Marked Up Version, PCT/ISA/210

U.S. APPLICATION NO (If known, see 37 C F R 1 5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
UNKNOWN 10/070009	PCT/EP00/10129	616.98USWO

17. [X] The following fees are submitted:	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492(a) (1)-(5)):		
Search Report has been prepared by the EPO or JPO **$890.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.492(a)(1)) **$710.00**		
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) **$740.00**		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(3)) paid to USPTO **$1040.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) **$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	**$ 890.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	**$0**	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	5 -20 =	0	X **$18.00**	**$0**	
Independent claims	1 -3 =	0	X **$80.00**	**$0**	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$260.00**	**$0**	
TOTAL OF ABOVE CALCULATIONS =				**$890.00**	
Reduction by 1/2 for filing by small entity, if applicable. Small entity status is claimed pursuant to 37 CFR 1.27				**$0**	
SUBTOTAL =				**$890.00**	
Processing fee of **$130.00** for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f).			+	**$0**	
TOTAL NATIONAL FEE =				**$890.00**	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property			+	**$0**	
TOTAL FEES ENCLOSED =				**$890.00**	
				Amount to be: refunded	**$0**
				charged	**$0**

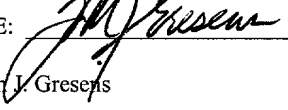
a. [X] Check(s) in the amount of $890.00 to cover the above fees is enclosed.

b. [ ] Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 13-2725.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO
John J. Gresens
MERCHANT & GOULD
P.O. Box 2903
Minneapolis, MN 55402-0903

SIGNATURE: 

NAME: John J. Gresens

REGISTRATION NUMBER: 33,112

10/070009
JC13 Rec'd PCT/PTO 28 FEB 2002

S/N unknown

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Gupta, et al.	Docket No.:	616.98USWO
Serial No.:	unknown	Filed:	concurrent herewith
Int'l Appln No.:	PCTEP0010129	Int'l Filing Date:	October 14, 2000
Title:	PRODUCTION OF CATALYST LAYERS ON DIAPHRAGMS FOR LOW-TEMPERATURE FUEL CELLS		

CERTIFICATE UNDER 37 CFR 1.10
'Express Mail' mailing label number: EV072823430US
Date of Deposit: February 28, 2002
I hereby certify that this paper or fee is being deposited with the United States Postal Service 'Express Mail Post Office To Addressee' service under 37 CFR 1.10 and is addressed to the Commissioner for Patents, Washington, D.C. 20231.

By:
Name: Chris Stordahl

EV072823430US

PRELIMINARY AMENDMENT

Box PCT
Assistant Commissioner for Patents
Washington, D. C. 20231

Dear Sir:

In connection with the above-identified application filed herewith, please enter the following preliminary amendment:

IN THE ABSTRACT

Insert the attached Abstract page into the application as the last page thereof.

IN THE SPECIFICATION

A courtesy copy of the present specification is enclosed herewith. However, the World Intellectual Property Office (WIPO) copy should be relied upon if it is already in the U.S. Patent Office.

IN THE CLAIMS

Please amend the claims as follows:

3. (AMENDED) A process as set forth in claim 1, wherein a further binder was added to the paste.

4. (AMENDED) A process as set forth in claim 1, wherein a plasticizer was mixed with the paste

5. (AMENDED) A process as set forth in claim 1, wherein the paste applied to the diaphragm in layer form is dried prior to the pressing operation at temperatures of between 30 and 80°C.

REMARKS

The above preliminary amendment is made to remove multiple dependencies from claims 3, 4, and 5.

A new abstract page is supplied to conform to that appearing on the publication page of the WIPO application, but the new Abstract is typed on a separate page as required by U.S. practice.

Applicants respectfully request that the preliminary amendment described herein be entered into the record prior to calculation of the filing fee and prior to examination and consideration of the above-identified application.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicants' primary attorney-of record, John J. Gresens (Reg. No. 33,112), at (612) 371.5265.

Respectfully submitted,

MERCHANT & GOULD P.C.
Post Office Box 2903
Minneapolis, Minnesota 55402-0903
(612) 332-5300

Dated: February 28, 2002

By _____
John J. Gresens
Reg. No. 33,112

JJG/rw

Forschungszentrum Jülich GmbH, 52428 Jülich
PCT application: Europe, USA, Canada, Japan PCT/EP00/10129
Priority: DE 199 51 936.6-45 of 28.10.1999

CLAIMS

1. A process for producing a diaphragm with applied catalytically active layer for use in low-temperature fuel cells, comprising the following steps:

a) processing a hydrophobic solvent, a catalytically active material and a polymer solution to form a paste, which does not contain any hydrophilic solvents.

b) applying the paste in layer form to a polymer diaphragm, and

c) pressing the diaphragm with the applied paste with the application of heat so that the solvents escape and the catalytically active material is fixed on the diaphragm.

2. A process as set forth in claim 1 wherein the paste is applied to the diaphragm in layer form by screen printing.

3. A process as set forth in claim 1 [or] claim 2 wherein a further binder was added to the paste.

4. A process as set forth in [one] of the preceding claims wherein a plasticizer was mixed with the paste.

5. A process as set forth in [one] of the preceding claims wherein the paste applied to the diaphragm in layer form is dried prior to the pressing operation at temperatures of between 30 and 80°C.

Forschungszentrum Jülich GmbH, 52428 Jülich
PCT application: Europe, USA, Canada, Japan
Priority: DE 199 51 936.6-45 of 28.10.1999

Production of catalyst layers on diaphragms for low-temperature fuel cells

The invention concerns the production of a catalyst layer on a diaphragm for low-temperature fuel cells.

DE 44 30 958 C1 and DE 195 31 852 C1 disclose fuel cells comprising a cathode, an electrolyte and an anode. An oxidation agent (for example air) is fed into a passage or space adjoining the cathode and fuel (for example hydrogen) is fed into a passage or space adjoining the anode.

The operating agents pass to the electrodes and are depleted there. The depleted operating agents then issue again and are passed out of the fuel cell.

At the anode of the fuel cell known from DE 195 31 852 C1 protons are formed in the presence of the fuel by means of a catalyst. The protons pass through a diaphragm provided as the electrolyte and are combined on the cathode side with the oxygen originating from the oxidation agent to form water. Electrons are liberated at the anode and electrical energy is generated in that way.

Catalyst layers are applied on both sides of a diaphragm in a low-temperature fuel cell. The diaphragm comprises polymer material, thus for example Nafion®. In general terms a respective porous gas diffusion layer is applied to the layers which comprise catalyst material. The gas diffusion layer serves both for distribution of the reactands and also for carrying away the current.

In a production process the active layer, that is to say the catalyst layer, is applied to a carrier. The carrier is pressed to the diaphragm so that the active layer adjoins the diaphragm. The carrier is then removed.

Although high-quality catalyst layers can be produced with that process, it suffers from the disadvantage that a plurality of processing steps are required. In addition there is the risk of incomplete transfer of the catalyst material onto the diaphragm so that a certain proportion of catalyst material is not put to use.

In order to minimize the number of working steps, the catalyst mixture should be applied directly to the diaphragm. The attempt has therefore been made to spray the active layer, that is to say the layer consisting of catalyst material, onto a gas diffusion layer. In that procedure, carbon-borne noble metal catalysts are used as the material involved. A gas diffusion layer is then joined to the diaphragm on one side by a hot pressing operation. The catalyst layer is then between the diaphragm and the gas diffusion layer.

Admittedly the above-indicated process minimizes the number of production steps. It is found however to suffer from the problem that a solvent is used with that process. Swelling of the diaphragm material could not be avoided by virtue of the solvent. In general then the diaphragm material is distorted so severely that a coating operation is no longer possible.

The above-mentioned problem is resolved with the process known from the publication "M. S. Wilson, S. Gottesfeld, J. Elektrochem. Soc., Vol. 139 (2), L28, 1992", insofar as the diaphragm is held fast on a vacuum table by means of a reduced pressure while the catalyst material is applied with a stepping motor-controlled spray unit. The process admittedly operates well, but it requires a considerable level of apparatus complication and expenditure. It is therefore comparatively expensive.

DE 197 05 469 C1 discloses a process in which a mask is applied to a substrate by means of a photoresist. Catalyst material such as for example platinum is then applied through the mask to the substrate electrochemically or by sputtering. The photoresist is removed by

exposure. A diaphragm is pressed to the catalyst material which is disposed on the substrate. The substrate is finally dissolved away.

The above-indicated process for applying catalyst material to a diaphragm also suffers from the disadvantage of involving a very large number of steps.

The object of the invention is to provide a process with which the catalyst material can be easily and inexpensively applied to a diaphragm.

The object of the invention is attained by a process having the features of the first claim. Advantageous configurations are set forth in the appendant claims.

In accordance with the claim a paste is produced from a non-polar solvent, catalytically active material and a polymer solution. The applied layer is joined to the diaphragm by hot pressing. The solvents escape during that procedure.

Platinum is typically used as the catalytically active material. Nafion® represents an example of a suitable polymer. The solvent used can be a commercially available thin-film diluent, thus for example the thin-film diluent 8470 from DuPont. Such a thin-film diluent substantially comprises a terpineol-isomer mixture to which further components are added in order to improve the wetting of solid substances.

An essential measure according to the invention is the provision of a hydrophobic, that is to say non-polar solvent. More specifically it has been found that polar solvents such as for example water are responsible for swelling of the diaphragm. The problem in regard to swelling is therefore avoided by using hydrophobic solvents (non-polar solvents). This measure therefore makes it possible to directly apply a layer to the diaphragm, press it in a hot condition and thus attain the desired result in a few processing steps.

The temperature during such a working procedure is for example 140°C. In principle the temperature can be so selected that the solvents evaporate during the pressing procedure without in other respects the

materials suffering damage. Temperatures around 140°C usually satisfy those requirements.

The catalytically active material is desirably on a carrier material such as for example carbon. In that way a large catalytically active area is afforded, with the minimum use of catalyst material. The costs for expensive catalytically active material such as for example platinum or rubidium are minimized in that way.

The polymers in the paste serve to join the catalytically active material to the polymer diaphragm. Ideally, the polymer used in the paste is a polymer which constitutes the diaphragm. That ensures to a particular degree that the desired bonding of the catalyst material to the diaphragm is reliably achieved.

The paste can be applied to the polymer diaphragm by a thick-film procedure, thus for example by stencil printing. It is particularly advantageous to use a screen printing process as it is possible to provide a precise metering action in that way. In addition the layers produced by screen printing are particularly homogenous. Material losses are also minimized.

In a screen printing process a screen which is bordered by a frame is applied to the diaphragm. A paste is urged into the pores in the screen by means of a squeegee. The screen is then removed and the paste is present on the diaphragm in layer form. As already mentioned the paste is then pressed to the diaphragm in the hot condition.

It is possible in that way to apply to the diaphragm catalyst layers which for example are between 10 and 100 μm in thickness.

Advantageously the applied paste is initially dried at elevated temperatures prior to the pressing operation. The term elevated temperatures is used to denote temperatures a little above ambient temperature. They are substantially below the temperature at which the layer is pressed to the diaphragm. 50°C is a suitable drying temperature.

In a further advantageous configuration of the process, besides the polymer material, a further binder is added to the paste in order to strengthen the subsequent bonding of the catalyst material to the diaphragm. It is possible to use conventional binders which are known from screen printing, insofar as they contain hydrophobic solvents. The binders are also to be so selected that the solvents present therein evaporate at the processing temperatures. Evaporation should therefore begin in particular below 140°C.

An example of an additional binder is represented by PHE. This involves phthalic acid bis-(2-ethylhexylester). Polyvinylbuteral (PVB) or ethyl cellulose are further examples of additional binders.

It is further desirable for a plasticizer to be added to the paste. That avoids subsequent crack formation. The above-indicated demands are to be made on the plasticizer. The plasticizer may therefore not contain any polar solvents. In addition solvents must evaporate at the operating temperatures.

Oleic acid or phthalic acid bis-(2-ethylhexylester) (PHE) are examples of suitable plasticizers.

Embodiment:

Solid material pt/carbon is mixed with agitation with 5 % by volume of Nafion solution from DuPont or Fluka 1:2 pt/carbon:Nafion solution so that the mass is homogenously wetted. A subsequent drying procedure at 80°C results in the solid material being uniformly encased with the polymer. That mass (0.77g) is then coarsely pulverized and mixed with (2.6g of) a solvent mixture (thin-film diluent 8470 from DuPont with or without 0.1 % by weight of binder). Some drops (0.05g) of oleic acid or PHE are added and the entire mass is homogenized on a three-roll mill. During the homogenization procedure some solvent is additionally added until a spreadable paste is produced. In that operation previously produced agglomerates are mechanically broken down and a uniform grain size achieved.

That paste is applied to the polymer diaphragm by a thick-film process, in this case with screen printing or with stencil printing. In that way a 10-100 μm catalyst layer can be applied in one coating step. A diaphragm-electrode unit which is coated in that way is finally dried at 50°C and the layer, that is to say the electrode, is fixed at 130°C under pressure on the diaphragm.

Due to the stability in respect of shape achieved for the diaphragm during production of the composite assembly the production procedure can be easily converted into mass production.

Forschungszentrum Jülich GmbH, 52428 Jülich

PCT application: Europe, USA, Canada, Japan PCT/EP00/10129

Priority: DE 199 51 936.6-45 of 28.10.1999

CLAIMS

1. A process for producing a diaphragm with applied catalytically active layer for use in low-temperature fuel cells, comprising the following steps:

a) processing a hydrophobic solvent, a catalytically active material and a polymer solution to form a paste, which does not contain any hydrophilic solvents.

b) applying the paste in layer form to a polymer diaphragm, and

c) pressing the diaphragm with the applied paste with the application of heat so that the solvents escape and the catalytically active material is fixed on the diaphragm.

2. A process as set forth in claim 1 wherein the paste is applied to the diaphragm in layer form by screen printing.

3. A process as set forth in claim 1 or claim 2 wherein a further binder was added to the paste.

4. A process as set forth in one of the preceding claims wherein a plasticizer was mixed with the paste.

5. A process as set forth in one of the preceding claims wherein the paste applied to the diaphragm in layer form is dried prior to the pressing operation at temperatures of between 30 and 80°C.

Abstract

The invention concerns a process for applying catalytically active material to a polymer diaphragm for low-temperature fuel cells.

In accordance with the invention a non-polar solvent, catalytically active material and a polymer solution are processed to form a paste. The paste is applied to the diaphragm in layer form, in particular by screen printing. Then the paste is dried and pressed to the diaphragm with the application of heat.

Swelling of the diaphragm is avoided by virtue of the presence of non-polar solvents. It is therefore possible to produce the desired product with a few processing steps. Material losses are minimized by the provision of the screen printing procedure.

Overall therefore the process is simple and inexpensive.

Translated by FreeTranslation.com

G 61678

Attorney Docket No. 616.98USWO

MERCHANT & GOULD P.C.

United States Patent Application

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that

I verily believe I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: PRODUCTION OF CATALYST LAYERS ON DIAPHRAGMS FOR LOW-TEMPERATURE FUEL CELLS

The specification of which
a. ☒ is attached hereto
b. ☒ was filed on _____ as application serial no. _____ and was amended on _____ (if applicable) (in the case of a PCT-filed application) described and claimed in international no. PCT/EP00/10129 filed October 14, 2000 and as amended on _____ (if any), which I have reviewed and for which I solicit a United States patent.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119/365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on the basis of which priority is claimed:

a. ☐ no such applications have been filed.
b. ☒ such applications have been filed as follows:

FOREIGN APPLICATION(S), IF ANY, CLAIMING PRIORITY UNDER 35 USC § 119			
COUNTRY	**APPLICATION NUMBER**	**DATE OF FILING (day, month, year)**	**DATE OF ISSUE (day, month, year)**
GERMANY	19951936.6	28/OCTOBER/1999	
ALL FOREIGN APPLICATION(S), IF ANY, FILED BEFORE THE PRIORITY APPLICATION(S)			
COUNTRY	**APPLICATION NUMBER**	**DATE OF FILING (day, month, year)**	**DATE OF ISSUE (day, month, year)**

I hereby claim the benefit under Title 35, United States Code, § 120/365 of any United States and PCT international application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. APPLICATION NUMBER	DATE OF FILING (day, month, year)	STATUS (patented, pending, abandoned)

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below:

U.S. PROVISIONAL APPLICATION NUMBER	DATE OF FILING (Day, Month, Year)

I acknowledge the duty to disclose information that is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56 (reprinted below):

§ 1.56 Duty to disclose information material to patentability.

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is canceled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) prior art cited in search reports of a foreign patent office in a counterpart application, and

(2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

(1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1) Each inventor named in the application:

(2) Each attorney or agent who prepares or prosecutes the application; and

(3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.

(e) In any continuation-in-part application, the duty under this section includes the duty to disclose to the Office all information known to the person to be material to patentability, as defined in paragraph (b) of this section, which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby appoint the following attorney(s) and/or patent agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith:

Albrecht, John W.	Reg. No. 40,481
Ali, M. Jeffer	Reg. No. 46,359
Altera, Allan G.	Reg. No. 40,274
Anderson, Gregg I.	Reg. No. 28,828
Batzli, Brian H.	Reg. No. 32,960
Beard, John L.	Reg. No. 27,612
Berns, John M.	Reg. No. 43,496
Branch, John W.	Reg. No. 41,633
Brown, Jeffrey C.	Reg. No. 41,643
Bruess, Steven C.	Reg. No. 34,130
Byrne, Linda M.	Reg. No. 32,404
Campbell, Keith	Reg. No. 46,597
Carlson, Alan G.	Reg. No. 25,959
Caspers, Philip P.	Reg. No. 33,227
Clifford, John A.	Reg. No. 30,247
Cook, Jeffrey	Reg. No. 48,649
Daignault, Ronald A.	Reg. No. 25,968
Daley, Dennis R.	Reg. No. 34,994
Daulton, Julie R.	Reg. No. 36,414
DeVries Smith, Katherine M.	Reg. No. 42,157
DiPietro, Mark J.	Reg. No. 28,707
Doscotch, Matthew A.	Reg No. P-48,957
Edell, Robert T.	Reg. No. 20,187
Epp Ryan, Sandra	Reg. No. 39,667
Glance, Robert J.	Reg. No. 40,620
Goff, Jared S.	Reg. No. 44,716
Goggin, Matthew J.	Reg. No. 44,125
Golla, Charles E.	Reg. No. 26,896
Gorman, Alan G.	Reg. No. 38,472
Gould, John D.	Reg. No. 18,223
Gregson, Richard	Reg. No. 41,804
Gresens, John J.	Reg. No. 33,112
Hamer, Samuel A.	Reg. No. 46,754
Hamre, Curtis B.	Reg. No. 29,165
Harrison, Kevin C.	Reg. No. 46,759
Hertzberg, Brett A.	Reg. No. 42,660
Hillson, Randall A.	Reg. No. 31,838
Holzer, Jr., Richard J.	Reg. No. 42,668
Hope, Leonard J.	Reg. No. 44,774
Jardine, John S.	Reg. No. P-48,835
Johns, Nicholas P.	Reg. No. 48,995
Johnston, Scott W.	Reg. No. 39,721
Kadievitch, Natalie D.	Reg. No. 34,196
Kaseburg, Frederick A.	Reg. No. 47,695
Kettelberger, Denise	Reg. No. 33,924
Keys, Jeramie J.	Reg. No. 42,724
Knearl, Homer L.	Reg. No. 21,197
Kowalchyk, Alan W.	Reg. No. 31,535
Kowalchyk, Katherine M.	Reg. No. 36,848
Lacy, Paul E.	Reg. No. 38,946
Larson, James A.	Reg. No. 40,443
Leonard, Christopher J.	Reg. No. 41,940
Liepa, Mara E.	Reg. No. 40,066
Lindquist, Timothy A.	Reg. No. 40,701
Lown, Jean A.	Reg. No. 48,428
Mayfield, Denise L.	Reg. No. 33,732
McDonald, Daniel W.	Reg. No. 32,044
McIntyre, Jr., William F.	Reg. No. 44,921
Mitchem, M. Todd	Reg. No. 40,731
Mueller, Douglas P.	Reg. No. 30,300
Nelson, Anna M.	Reg. No. 48,935
Paley, Kenneth B.	Reg. No. 38,989
Parsons, Nancy J.	Reg. No. 40,364
Pauly, Daniel M.	Reg. No. 40,123
Phillips, John B.	Reg. No. 37,206
Pino, Mark J.	Reg. No. 43,858
Prendergast, Paul	Reg. No. 46,068
Pytel, Melissa J.	Reg. No. 41,512
Qualey, Terry	Reg. No. 25,148
Reich, John C.	Reg. No. 37,703
Reiland, Earl D.	Reg. No. 25,767
Samuels, Lisa A.	Reg. No. 43,080
Schmaltz, David G.	Reg. No. 39,828
Schuman, Mark D.	Reg. No. 31,197
Schumann, Michael D.	Reg. No. 30,422
Scull, Timothy B.	Reg. No. 42,137
Sebald, Gregory A.	Reg. No. 33,280
Skoog, Mark T.	Reg. No. 40,178
Spellman, Steven J.	Reg. No. 45,124
Stewart, Alan R.	Reg. No. 47,974
Stoll-DeBell, Kirstin L.	Reg. No. 43,164
Sullivan, Timothy	Reg. No. 47,981
Sumner, John P.	Reg. No. 29,114
Swenson, Erik G.	Reg. No. 45,147
Tellekson, David K.	Reg. No. 32,314
Trembath, Jon R.	Reg. No. 38,344
Tunheim, Marcia A.	Reg. No. 42,189
Underhill, Albert L.	Reg. No. 27,403
Vandenburgh, J. Derek	Reg. No. 32,179
Wahl, John R.	Reg. No. 33,044
Weaver, Paul L.	Reg. No. 48,640
Welter, Paul A.	Reg. No. 20,890
Whipps, Brian	Reg. No. 43,261
Whitaker, John E.	Reg. No. 42,222
Wier, David D.	Reg. No. P-48,229
Williams, Douglas J.	Reg. No. 27,054
Withers, James D.	Reg. No. 40,376
Witt, Jonelle	Reg. No. 41,980
Wong, Thomas S.	Reg. No. 48,577
Wu, Tong	Reg. No. 43,361
Young, Thomas	Reg. No. 25,796
Zeuli, Anthony R.	Reg. No. 45,255

I hereby authorize them to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct Merchant & Gould P.C. to the contrary.

I understand that the execution of this document, and the grant of a power of attorney, does not in itself establish an attorney-client relationship between the undersigned and the law firm Merchant & Gould P.C., or any of its attorneys.

Please direct all correspondence in this case to Merchant & Gould P.C. at the address indicated below:

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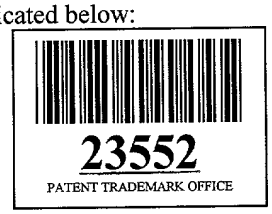

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2	Full Name Of Inventor 1 - 00	Family Name GUPTA	First Given Name Ashok	Second Given Name Kumar
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